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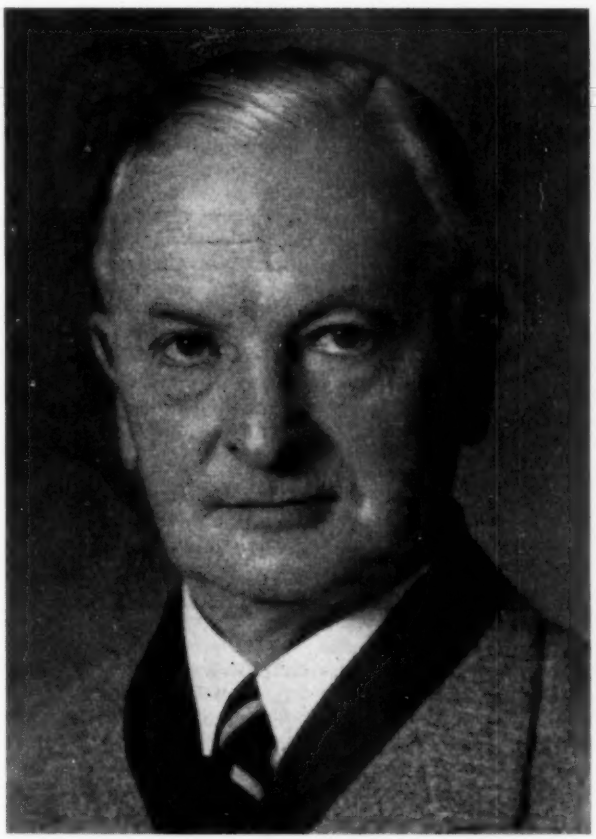
The perpetration of a cliché at the commencement of a Presidential Address requires a certain amount of courage. This is particularly so when the thought expressed is not only hackneyed and time-worn, but also widely questioned. I propose nevertheless to adopt as my thesis the idea that general practitioners form the backbone of the medical profession.

The functions of the vertebral column have been defined as the support of the trunk, the transmission of its weight to the pelvis and lower extremities, and the protection of the spinal cord.

If this analogy be accepted as not too fanciful, our medical backbone can be regarded as supporting the whole body of the profession, bearing its burdens and giving it momentum, and by wise interpretation and assistance helping patients to understand the activities of consultants.

To do this the general practitioner must be educated in an appreciation, at least, of the techniques and approaches of the specialists he advises his patients to consult. His training must be sufficiently catholic to enable him to speak with some authority on all branches of medicine. It is of course only right that years of arduous and often unremunerative preparation should be recognized and rewarded in the case of the specialist, but I sometimes feel that it is the general practitioner, if he is to be a good one, who should be specially selected and specially prepared for his task.

This preparation must of course be shared with all other types of doctor. Whatever their future, medical students cannot be expected to appreciate all the factors involved in their selection of any particular medical career until they have had considerable contact with medical matters. Early differentiation, even in ambition, is a mistake, for youthful enthusiasms can be aroused and imaginations stirred by a succession of attractions.



Mr. Currie

A Good General Education

The first pre-requisite is a good general education. It cannot be emphasized too strongly that doctors are and should always be members of a learned profession. However refined and accurate the technocracy which they adorn, they will never reach full stature without the human breadth given by some initial capacity for a general interest in a variety of subjects. Others have written of the two cultures, Science and Humanism, with medicine in between, steadily tending to move in an Arnethian shift to the left away from the broader cultures. I feel that we must keep our students in contact with those in other faculties. Mercifully, the social and athletic activities of academic life tend to de-segregate the doctor.

One desideratum in an educated man is the gift of being explicit and articulate in language. In a bilingual country such as ours, the really perfectly bilingual have so great an advantage in mental agility and elasticity that they are to be greatly envied, provided that the trap of mediocrity in both languages can be avoided. This projection into another language should usually make it easy to have some acquaintance with a third, and I feel that doctors should learn one of the major European languages for its interest, its literature, and the access it gives to appropriate medical publications. To this polyglot

* Held at the City Hall, Cape Town, on Monday, 25 September 1961.

equipment might well be added a basic knowledge of the Bantu tongue most prevalent in the area.

Medical Training

We will assume that our embryo doctor is reasonably well educated, is interested in ideas, and has reached a medical school. He is now subjected to a series of disciplines which should not only give him a smattering of science, but should also fill him with an appreciation of main principles, perhaps in some cases useful memories of certain scientific details, and a mode of thought which will fit him for his career.

From then on his education is in the hands of a variety of medical specialists and it is often claimed that this is wrong, since no training is given for general practice. I do not agree. Training for general practice must come, but it is right to subject the student in his training to the full pressures of academic thought. He is still undifferentiated, a pluripotential cell in the medical blastema, and his evolution demands these pressures. One of my worries about students, however, is the quickfire changes to which they are subjected. In my day we attended outpatient sessions for hours, postmortems for what seemed like ages, and lectures whenever we could not avoid them. Nowadays the life of our students is parcelled out in a series of short, high-powered sessions, and I wonder that they ever have time for any continuity of thought. However, the results seem to be good.

Teaching for general practice is of course a necessity, unless general practice vanishes as some think it will. A shining example of what can be done is to be found in the General Practice Teaching Unit of Edinburgh University, where two groups of general practitioners, each associated with a nurse and an almoner, all holding University appointments, are responsible for the compulsory training in General Practice of all the medical students at the University. Some such scheme as this should, I believe, be adopted everywhere.

Having now converted our embryo medical practitioner into a basic doctor (a horrible phrase for which I can find no substitute), thoughts on differentiation, previously entertained, must come to fruition; but I do not think that the future general practitioner should immediately launch himself into practice. Some people advocate three or four years of postgraduate work for the practitioner. This is obviously impracticable for economic reasons, but it should be as long as possible.

The Present State of Medical Practice

I wish at this stage, having brought our doctor to his practice, to examine the present state of that practice. To revert to my earlier analogy, we shall now examine the disc lesions, subluxations, and other disabilities which affect our medical backbone.

A study of general practice must necessarily take into account variations in practice in different countries, and even from place to place in the same country. In some places doctors seem to be as yet unaffected by the dissatisfaction which oppresses their colleagues elsewhere.

The main complaint of general practitioners is that, owing to the development of specialities on the one hand and health services on the other, more and more of what used to be their work is being taken from them. In some countries, moreover, they are steadily losing all real contact with hospitals. They cannot treat their patients in hospital, they are deprived of those daily informal contacts with colleagues which form so vital a part of medical education, and, worst of all, the limitation of their activities leads to the assumption that they are a very ordinary sort of doctor, inferior in status to the specialist, and lacking in superior skills. To have the right to expertness denied to one is even more galling than to have one's living curtailed, and however much the position of the general practitioner needs re-appraisal in the light of the advance of specialization, this position becomes emotionally intolerable unless the importance of his functions is clearly established and widely recognized. In countries where differentiation between specialists and general practitioners is most marked, a widening gulf between the two groups is inevitable unless special steps are taken.

It is interesting to note that in Great Britain, where under the National Health Service the position of the general practitioner is carefully preserved, he is at the same time denied access to hospital beds and has to seek his salvation in other directions. That he is doing

Mr. John Alexander Currie is the son of the late Dr. O. J. Currie who was a well-known practitioner in the Southern Peninsula and after whom the Currie Block of the Wynberg Hospital was named. Mr. Currie was a student at Guy's Hospital, London, and during the first World War he served as a 2nd Lieutenant in the Royal Field Artillery. He received the diploma of M.R.C.S., L.R.C.P. (Lond.) in 1923, and the degrees of M.B., B.S. (Lond.) in 1924. He practised between the two World Wars as a general practitioner, and in 1938 he received the degrees of M.S. (Lond.) and F.R.C.S. (Eng.). In World War II he served as a Major in the South African Medical Corps. After the war Mr. Currie returned to Cape Town where he has practised as a specialist urologist. In addition to his private practice he is on the staff of the Groote Schuur Hospital and the Victoria Hospital, Wynberg. For many years he was also part-time urologist to the Military Hospital, Wynberg.

Mr. Currie has contributed a number of articles on urological subjects to the South African Medical Journal. *Since his return to Cape Town, Mr. Currie has taken a keen interest in the affairs of the Medical Association of South Africa. After serving on the Branch Council of the Cape Western Branch, he was elected to the Federal Council in 1953. As a member of Council he has served on the Central Committee for Contract Practice and is now a member of the Executive Committee. He was made President-Elect of the Association in 1960.*

so very effectively is evident from a perusal of the Journal of the College of General Practitioners, of which an active Faculty exists in this country. This, and similar bodies in Canada, New Zealand, Holland, the United States and elsewhere, have been responsible for a recrudescence of the flame of learning and a spirit of self-confidence in countries where it was previously flagging. Journal clubs, the circulation amongst members of recorded talks, and an obligatory attendance at refresher courses from time to time have all tended to stimulate a renaissance of that spirit of perpetual studentship which is the need of every doctor of whatever sort. One of the duties of Medical Associations is to bring doctors together. The College of General Practitioners brings general practitioners together in a special unity of aim and a special group consciousness, but, as is clearly apparent in its programmes and publications, it also brings general practitioners and specialists together. In this respect I claim that the various colleges are merely doing what the National Medical Associations have always done, but doing it in such a way as to place special emphasis on the educational needs of the general practitioner, and to foster his pride in his task. The two types of organizations are both needed and should give one another mutual support.

Problems of General Practice

No one interested in the problems of general practice should fail to read the articles on general practice on the Continent and in America published in the *British Medical Journal* early this year. Cronhelm's enthusiastic report on Canadian practice, Fulton's more critical assessment of the position in the United States, and Fry's account of Denmark, Holland, and Sweden (in the last of which countries true general practice is apparently dead) make fascinating reading. Resemblances and contrasts may both help us to understand what we wish to have in our own country.

In America, apart from the large hospitals in great centres, all general practitioners have access to local hospitals. To deny them this access would be to deprive them of their living, since the tendency is for all seriously ill patients to be admitted to hospital.

In some of the intermediate hospitals general practitioners are permitted facilities for the performance of surgical operations, but there are many checks and safeguards. Each department in such hospitals is under the authority of a departmental head who is a specialist. Facilities may be withdrawn from an operator who seems to be exceeding his capacity. All doctors on the staff must attend staff meetings where criticism is liable to be severe, and 'tissue committees' examine specimens removed at operations. Similarly, general practitioners may give anaesthetics, but the hospital boards insist on a high standard of training and performance. I know from personal experience that some general practitioners can reach and maintain this high standard. Many of you will remember the anecdote about a well-known doctor, a habitual anaesthetist, who was asked anxiously by a patient if he was a specialist. He replied 'No, but I am an expert'.

It would seem that in Canada general practice is holding its own, but in the United States it is on the wane and specialism on the upgrade, so much so that Fulton quotes a patient who laments that although she has a good gynaecologist for her menorrhagia, a first-class dermatologist for her eczema, and a very efficient endocrinologist for her tendency to hyperthyroidism, she sometimes wishes that she had a doctor.

In days past general practitioners attached to hospitals tended to give a full service, and this included surgical operations. Many of them were highly skilled surgeons and did work of the highest order, often in situations where there was no one else available to do the work. It is, however, to be questioned whether surgical work done by the mass of general practitioners was as beneficial as the work now done by those specially trained. And yet it would be, in my opinion, completely wrong to allow a man to qualify with no capacity at all for, at least, emergency surgery. And the so-called 'minor surgery', which, however minor, must still be based on surgical principles, is part of the daily life of the good all-round practitioner. In spite of modern ease of transport there are remote or less accessible rural areas where it is incumbent on doctors to be adequately trained in emergency surgery, and it would be wrong to exclude such training from the curriculum. The same applies to anaesthetics — which is certainly a highly specialized and expert branch of medicine, but one at which doctors in rural areas must be reasonably proficient. I do not, however, believe that such operations or such anaesthetics should be contemplated without training under supervision and much burning of midnight oil.

The Relationship between General Practitioners and Specialists

The rigidity of separation between general practitioners and specialists needs modification in the sense that emergence from one branch of the profession to the other should not be wholly impossible. We need more elasticity in our concepts. My eyes were certainly opened by certain editorial statements in the Journal of the College of General Practitioners for May 1961, which discussed the report on the medical staffing structure in the Hospital Service in Britain. The report was produced by a Joint Working Party under the Chairmanship of Sir Robert Platt, and included no general practitioners. Nevertheless, the working party envisaged an extension of hospital posts available to general practitioners, and contemplated in certain cases the performance by such practitioners of surgical operations. The report even went on to advocate that 'in some instances a general practitioner, who has continued to work in the Hospital Service in such a capacity, might later be chosen for a consultant post and pursue a career as a consultant concurrently with one as a general practitioner'. As the editorial suggests, surely the wheel has turned full circle!

In South Africa we have large numbers of smaller hospitals, some attaining the proportions of small general hospitals, which are staffed by both specialists and general practitioners, or, in the case of rural areas, exclusively by general practitioners. I should like to see this situation perpetuated, with the proviso that the enormous privilege

of a hospital appointment, and association with one's colleagues, should be paid for. The payment exacted is hard study and arduous work.

However, it must be realized that specialization has come to stay, and that the majority of general practitioners will not practice major surgery or give many anaesthetics. What then is the public to expect of the general practitioner, the family doctor, the friend and adviser who was formerly equal or thought to be equal, to every exigency of practice?

The Ideal General Practitioner

In the first place he must have, as I indicated earlier in this address, a broad enough knowledge of medicine and surgery and their techniques to enable him to give his patients informed advice, to quell their fears, and to encourage their convalescence. His general medical knowledge must be adequate and up-to-date, so that he can cope with the majority of their illnesses by virtue of his own intellectual resources and manual skill. He must be a clinical diagnostician, a knower of syndromes and an eliciter of clinical signs. He must be a psychologist, not necessarily wholly invested with the somewhat awesome authority of the psychiatrist, but at least versed in the main practices and concepts of the psychiatrist's approach. Perhaps he may temper this with a little common sense, a sense of the economic needs and limitations of his patients, and a vast amount of that gift for therapeutic listening which all patients value so much. He must be kind, but must never abdicate from that authoritative approach which patients in their hearts respect and, above all, he must be available. This question of availability confronts us with a problem. The modern tendency to form firms of general practitioners has the advantage of giving doctors days of leisure, days of study, and periods of well-earned leave. In this group practice it often happens that the doctor for whom a patient sends does not arrive, but one of his partners (who is not so much liked by that particular patient) comes in his place. This is inevitable. Nevertheless, the wishes of patients should be respected as far as possible, and the old rule of always going if sent for by a patient 'in the practice', should be followed. Somebody should go.

From the point of view of the specialist I feel that the general practitioner is indispensable. Domiciliary visits by specialists are not as unpopular in Canada or America as they are here or in Britain. I believe that they are a mistake, except when undertaken at the request of a general practitioner or in consultation with him. The patient should be in his doctor's care before going to hospital or a nursing home, and should return to that care afterwards, and the doctor should know what has been going on. He is the hub of the wheel, whose radiating spokes lead to a variety of consultants. Shopping around at the periphery, with no one knowing which spoke the patient will flit to next, is a profitless procedure.

If a doctor does this job well, he will enjoy his life, benefit his patients, further the cause of medicine, and do something to merit Robert Louis Stevenson's somewhat extravagant praise of doctors as the flower of our civilization.

Such a doctor deserves reasonable emoluments and does not always get them. I have sedulously avoided, in this address, a consideration of the vexed question of medical economics. That, as Kipling says, is another story.

Die Broederskap van Geneeshere

Alhoewel dit nie die langste deel van my toespraak is nie, handel hierdie deel wat ek nou in Afrikaans wil lewer oor 'n onderwerp wat baie na aan my hart lê en waaroor ek besonder sterk voel. Die feit dat ek dit in Afrikaans lewer, beteken egter nie dat ek dit net aan my Afrikaanse kollegas rig nie. Ek dink hier aan die hele professie.

Wat ek wil sê, handel oor die noodsaaklike eenheid van alle dokters as een groot geheel — 'n groep geesverwante wat, soos Nelson se kapteins, bymekaar gehou word deur die gemeenskaplike bande van veeleisende opleiding, gemeenskaplike belange, streng dissipline, en toewyding aan 'n ideaal wat deur almal aanvaar word.

Die tye het egter verander. Die eise wat deur die Mediese Professie gestel word, is grotendeels eise wat ons op onsself lê, en ons kan ons doelstellings slegs bereik deur oortuigingswerk te doen.

Die uitgesproke doel van die Mediese Vereniging van Suid-Afrika is om die eer en belange van die mediese professie te bevorder, en dit is belangrik om hier daarop te let dat die woord ‚eer' eerste genoem word.

Ek voel oortuig daarvan dat hiermee bedoel word dat ons ons pligte sowel as ons voorregte naarstiglik moet koester, dat ons die belange van ons pasiënte bo ons eie belange moet stel, en dat ons ons mededokters as vriende en kollegas moet bejeën in die gees van welwillende en hulpvaardige mededinging.

Die Tak Wes-Kaapland is u gashere by hierdie Kongres, en, ten spyte daarvan dat die Kongres noodsaaklikerwyse in die Moederstad plaasvind, moet dit onthou word dat ons ten volle put uit die beste vermoëns en bronne van altwee ons mediese skole. Ons funksioneer inderdaad nie as teenoorgesteldes nie maar as aanvullendes. Die verskillende tale wat ons praat is nie 'n belemmering nie, maar 'n uitdaging. Die herkoms van ons leermeesters, van ons studente, en van ons pasiënte mag verskillend wees; maar hierdie verskille sal verdwyn, en ons twee universiteite sal enerse, aanvullende en gelyke mededingers word — die Yale en Harvard of die Oxford en Cambridge van ons land.

Die strewe van die Vereniging is om genoegsame vergoeding vir dokters te verseker, om wetenskaplike standaarde hoog te hou, om ons pasiënte te beskerm, en om die dokters self gelukkig en besield te hou. Bowe alles wil ek egter graag hierdie beginsel beklemtoon — dat alle dokters vandag, afgesien van hul ras, taal, of oorsprong, ons professionele kollegas en goedgesinde bondgenote is.

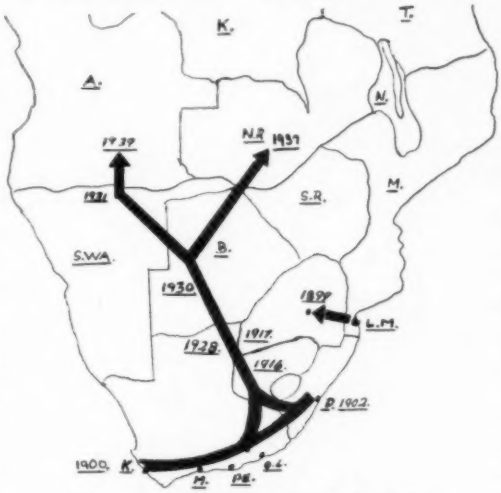
As alles wat ek hier genoem het werklik ons oogmerke is, moet ons die volgende vraag aan onsself stel: nie wat het die Vereniging vir my gedoen nie, maar wat het ek vir die Vereniging gedoen?

VAN DIE REDAKSIE : EDITORIAL

PES — GEEN HUIDIGE GEVAAR?

Pes is 'n aansteeklike epidemiese siekte, hoofsaaklik onder rotte; dit kan egter ook na die mens oorgedra word deur besmette vlooie. Vir die geneesheer is pes vandag 'n seldsame verskynsel, 'n haas onbekende siekte, wat oënskynlik geen werklike bedreiging vir die gemeenskap inhou nie en hoofsaaklik oorskadu word deur die meer ‚moderne siektes'. Huidige toestande elders op hierdie kontinent gee aanleiding tot gesondheidsdienste van wisselende aard en skep daardeur 'n genoegsame potensiële gevaar van pesindringing oor die noordelike grense van die Republiek, in so 'n mate dat dit nouliks op die agtergrond geskuiwe kan word.

Die geskiedenis leer ons dat die Suid-Afrikaanse endemiese pes, soos dit nog voorkom in sekere streke van tyd tot tyd, die land binnegekom het deur hawestede soos Kaapstad, Port-Elizabeth en Durban. Die heel eerste (Suid-Afrikaanse) geval van pes is egter afkomstig van Lourenço Marques. In Januarie 1899 doen die skip ‚Gironde' van Madagaskar by Delagoabaai aan, en hierdie besoek word gevolg deur 'n verdagte mortaliteit onder rotte in daardie hawe. Pes breek daarna uit onder 4 Indiërs, van wie 3 oorlede is. Een geval wat per trein op reis was na Heidelberg (Tvl.) word op Middelburg afgelaai waar hierdie fokus van pes blykbaar uitsterwe.



Die verspreiding van pes in Suid-Afrika

Die volgende uitbreking van pes val saam met die Anglo-Boereoorlog waartydens alle Suid-Afrikaanse hawestede pes-epidemies belewe tussen 1900 - 1905. Op 5 Maart 1900 arriveer die ‚S.S. Kilburn' van Rosario af in Suid-Amerika met 'n vrag perdevoer aan boord. In Oktober dieselfde jaar is daar 4 sterfgevalle van pes op King Williams' Town, waarnatoe sommige van die vrag vervoer is. Vroeg in 1901 vind 'n ongekende hoë mortaliteit onder rotte op die suider-arm van die Kaapstadse hawe plaas wat op hierdie tydstip onder militêre beheer was. 'n Massa eksodus van rotte volg na die stad en omliggende dele met 'n gevolglike pes-epidemie onder die bevolking van Kaapstad, waarin 371 sterftes voorgekom het uit 766 gevalle.

Tussen 1902 - 1903 tref 'n pes-epidemie Durban en Pietermaritzburg, waarin 145 sterftes voorkom uit 201 gevalle, waarskynlik ingebring deur die ‚S.S. Kassala' ook van Argentinië af. Ander hawestede soos Port-Elizabeth, Oos-Londen en Mosselbaai spring ook nie vry nie. Aan die Witwatersrandse gebied vind daar in die jaar 1904, 86 sterftes plaas uit 124 gevalle, hoofsaaklik weens die vervoer van besmette goedere per spoor. Hierdie tipiese rottepes epidemies, hoofsaaklik afkomstig van Argentinië, kom in 1907 tot 'n einde as gevolg van die vinnige optrede en doeltreffende maatreëls van die gesondheidsowerhede.

In 1914 breek daar egter sporadiese pes uit op vele plattelandse plekke en plase in die Kaapse Middellande en Oostelike Provinsie, wat nuwe hoofbrekens besorg vir die owerhede, aangesien geen infektiewe fokus van die handelsroetes af op hierdie tydstip bekend is nie. 'n Migrerende patroon van verspreiding volg: In 1916 breek sporadiese pes in die Vrystaat uit; in 1917 in die Transvaal, en in 1928 bereik die pes die suidelike grens van Betsjoeanaland. In 1930 - 1931 word die Kalahari oorgesteek en bereik die pes Ovamboland, waar dit 'n aantal epidemies veroorsaak. Van hier sprei dit na Angola en Noord-Rhodesië, maar daar het tot dusver geen samesmelting met die Sentraal-Afrikaanse vorm plaasgevind nie.

Deur intensiewe navorsing[1] kom dit aan die lig dat daar na 1905 'n uitruiling van gashere plaasgevind het. Die gestreepte vaal veldmuis (*Rhabdomys pumilio*) het bv. die infeksie van rotte se vlooie verkry gedurende die epidemies van 1900 - 1905, daarna binnelands gemigreer en dit aan die meerkat (*Taterona lobengula*) sowel as aan 'n dosyn ander knaagdiere, soos bv. springhase, oorgedra, wat as reservoir van die infeksie gedien het. Die gewone muis (*Mastomys coucha*) het weer op sy beurt besmet geraak wanneer hy die gate en tonnels van die meerkat besoek het, waar die vlooie (veral *Dinopsyllus lyusus*) maande lank in stof kan bly voortleef en besmet bly. Sanderige dele van die land word by uitstek verkies deur meerkatte, soos bv. die Noordweste, die Kalahari, die O.V.S. en Betsjoeanaland, terwyl bergagtige dele van die Kaapprovinsie, Natal, en Basoetoland relatief vry is van besmette knaagdiere. Golwe van epizoönoses het gedurigdeur noordwaarts en weswaarts versprei. Van 1920 tot 1949 was daar in genoemde dele van die land 'n totaal van 2,136 gevalle van pes, waarvan 1,600 gevalle in die Vrystaat alleen voorgekom het. Hierdie syfers is indrukwekkend, veral aangesien dit 'n aanduiding gee van die omvang van die sg. ‚Sylvatic' of plattelandse pes in Suid-Afrika. Die vernietiging van knaagdiere, inenting van die bevolking, tesame met die afkamp en kontrolering van besmette gebiede, het pesgevalle tot 'n minimum beperk en op die oomblik 'n stilstaande fase laat bereik.

Die kliniese vorm van pes is gewoonlik die buboniese tiepe omdat die infeksie deur middel van vlooie plaasvind, terwyl die pneumonitiese vorm ongeveer 7% van die gevalle uitmaak. Die somermaande is die mees algemene tyd vir sulke uitbreke.

'n Herhaling van die geskiedenis is nouliks denkbaar. Maar, daar moet gewaak word teen moontlike infeksies van ons noordelike buurstate af, wat die land se grense mag oorsteek en 'n siekte kan veroorsaak wat in die verlede reeds sy onmiskenbare stempel op die wêreld se beskawing agtergelaat het. Juis in hierdie moontlike herverskyning van pes lê sy grootste gevaar. Nugtere realisme is die regte stap in die rigting om dit te voorkom.

1. Mitchell, J. A., Pirrie, J. H. H. en Ingram, A. (1926): Publ. S.A. Institute for Med. Res., 3, 89.

CARDIAC MUSCLE

New techniques and new concepts have added a great deal to our knowledge of cardiac function and metabolism. The stethoscope, the electrocardiograph, the polygraph, and studies of the isolated perfused heart led to basic concepts regarding the physiology and the bio-electric behaviour of the myocardium. The action potentials of single cardiac fibres have been studied, but the biochemical link between membrane depolarization and the initiation of contraction remains a mystery. The techniques of cardiac catheterization have yielded information by direct measurement of intracardiac pressures and flows, giving new insight into the haemodynamic changes in congenital and acquired heart disease. Coronary flow can be measured. The rate of respiratory gas exchange and uptake of substrate by the intact myocardium under a variety of conditions has become possible. Open-heart surgery has provided accessibility to the intact myocardium in the living organism. Thus, through a succession of technical developments, a great deal of research has provided evidence about the function, metabolism, and work of the intact heart in health and in disease.[1]

The cardiac myofibril is conceived as an orderly, integrated system of overlapping, thick and thin filaments. In a mature myocardial cell there are numerous myofibrils which are parallel to the long axis of the cell, but which appear to branch occasionally. The structural unit of the myofibril is the sarcomere, which lies between two consecutive Z lines, with adjacent lateral I bands, intermediate A bands, and a central H disc bisected by an M line. The myofibrillar structure is similar to that of skeletal muscle. One model of muscle contraction, not yet fully accepted, involves the movement of thin filaments relative to thick filaments during muscle contraction. The thin filaments are considered to move (during the contractile process) further toward the centre of the sarcomere, with consequent shortening of the I bands and H disc, and therefore of the sarcomere as a whole.[1,2]

The energy utilized for work of the contracting myocardium is produced by trapping of some of the energy released during the degradation of food material to carbon dioxide and water. By the process of oxidative phosphorylation this energy is captured in the high-energy phosphate bond of ATP, in which form it can be readily utilized. The system has been found to operate exclusively within one organelle, the mitochondrion. The mitochondrion occupies a key position in myocardial metabolism, because the entire machinery for energy production functions within this subcellular structure. Organized enzyme systems operate here.

There are at present six hypotheses regarding the contractile mechanism in heart muscle. Five of them deal with the interaction of the two major contractile proteins, myosin and actin, with ATP, and the sixth relates this system to a third protein, tropomyosin. Great controversy centres around the actual biochemical events in the cycle of shortening and relaxation. The precise molecular relationships of the contractile proteins are not clear. One plausible hypothesis has been referred to above. Fuller details of this interesting and fascinating subject must be read elsewhere.[1,2]

Of the variety of disorders occurring in man in which the contractility of muscle is impaired, none is more dramatic than congestive cardiac failure. Most of the common types of this condition result from defects in energy utilization, i.e. failure of the myofibril to assimilate phosphate-bond energy or to shorten properly in the contractile cycle. The precise mode of action of digitalis glycosides, which are of great value in treatment, is still unknown. Actomyosin may be involved in the union between the glycosides and heart muscle. It remains to be determined with more certainty what the specific activity of these compounds is that accounts for their positive inotropic effect in the failing myocardium.

Contributions by clinicians and physiologists have been important in developing our understanding of the physiology of heart muscle, but the field is now open at the molecular level so that biochemists must now study the specific biochemistry of the normal and failing heart, the contractile process, and the mode of action of the digitalis glycosides.

1. Symposium on the Physiology of Cardiac Muscle (1961): Amer. J. Med., 30, 649.
2. Holland, W. C. and Klein, R. L. (1960): *Chemistry of Heart Failure.* Charles C. Thomas: Springfield, USA.

GENERAL INDICATIONS FOR THE USE OF THE ARTIFICIAL KIDNEY*

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This paper reviews the indications for the use of the artificial kidney and reports our experience at Groote Schuur Hospital over the past 2 years. A full analysis appears in a separate communication.[1]

THE RÔLE OF THE ARTIFICIAL KIDNEY

Dialysis with the artificial kidney serves a twofold purpose. Firstly, the clinical condition in acute renal failure is much improved and morbidity is diminished by preventing or modifying the development of complications. The main factors contributing to mortality, such as infections, cardiopulmonary complications, bleeding and coma, may be favourably influenced. Secondly, the biochemical disturbance of uraemia is modified in that the abnormal electrolyte status and the acidosis are corrected, azotaemia is reduced, and hypothetical, as yet unidentified, toxic substances may be eliminated. In addition, overhydration can be countered by ultrafiltration. Dialysis in no way affects the kidneys except by altering the abnormal internal environment. Technical and physiological details concerning the operation of artificial kidneys are well reviewed elsewhere[2-5] and will not be considered.

INDICATIONS FOR THE USE OF THE ARTIFICIAL KIDNEY

The main groups of conditions which may require treatment with the artificial kidney include the following: acute renal failure, chronic renal failure, and systemic intoxications. In addition, both hepatic failure and intractable oedema have been treated by haemodialysis.

A. Acute Renal Failure

We have used the term 'acute renal failure' to designate a functional and not a pathological state.

Although the difficulty in differentiating acute renal circulatory insufficiency from acute tubular necrosis may be considerable, we believe that postrenal obstructive lesions, except peri-ureteric fibrosis, usually do not present difficulty in diagnosis. In our series, cases with acute circulatory insufficiency (prerenal uraemia) have not been dialysed. Acute tubular necrosis is by far the most common cause of acute renal failure. Among the less common causes are bilateral renal cortical necrosis and possibly the 'failed reflow' kidney.[6]

1. *Acute Tubular Necrosis*

This includes ischaemic and/or toxic varieties and is conveniently divided into:

Group I

(*a*) 'Medical'—nephrotoxic; haemolytic; and miscellaneous, e.g. 'hepatorenal failure', infections, and shock.

(*b*) 'Obstetric'—concealed accidental haemorrhage; postabortal; and miscellaneous, e.g. postpartum, and posteclamptic.

* The disposable twin-coil artificial kidney.

Group II

'Surgical'—postoperative; and post-traumatic, including 'crush syndrome' (ischaemic muscle necrosis).

The separation into two broad groups is of value, since the prognosis is much worse in group II, where there is 'accelerated' uraemia with early hyperkalaemia and rapid evolution of azotaemia. It is in this group, too, where, despite early dialysis, results are disappointing. These cases may be associated with a medical complication, e.g. transfusion reaction. The dominant feature of the illness is often the primary condition and this commonly overshadows the renal failure as a cause of death.

2. *Bilateral Renal Cortical Necrosis*

This condition has been described particularly in association with concealed accidental haemorrhage, but may also occur in the same clinical settings as acute tubular necrosis. Furthermore, the differentiation of the two conditions may be difficult. For these reasons it must be included in any analysis of acute renal failure caused by acute tubular necrosis. Where the cortical involvement is subtotal, recovery is possible. Examination of a renal biopsy specimen does not necessarily provide an accurate assessment of the extent of the damage and, therefore, energetic treatment should not be lightly abandoned. The necrosis in some of these cases is partial and dialysis may then be life-saving.

Table I reflects the incidence of the main sub-groups in which the abovementioned conditions are encountered.

TABLE I. THE MAIN CLINICAL SETTINGS OF ACUTE RENAL FAILURE—PERCENTAGE INCIDENCE FROM 5 RENAL CENTRES

	Group I				*Group II*			
	Obstetric		*Medical*		*Post-operative*		*Post-traumatic*	
	%	*No.*	%	*No.*	%	*No.*	%	*No.*
Philadelphia[7]	**16**	16	**46**	46*	**32**	32	**6**	6
Albany[8]	**13**	10	**16**	13	**50**	40	**21**	17
Hammersmith[9,10] ..	**18**	20	**15**	16	**41**	45**	**26**	29
Leeds[5]	**40**	25	**21**	13	**29**	18	**11**	7
Cape Town	**45**	25	**18**	10	**24**	13	**13**	7

Bold-face figures indicate percentage incidence.

* No less than 24 of these 46 medical cases were attributable to intravascular haemolysis.

** Five cases associated with a surgical condition, but in which no operation was performed, are excluded from group II here.

The experience at Groote Schuur Hospital is compared with that of 4 other centres.[5,7-10]

3. *Vascular Accidents*

These are rare causes of acute renal failure, but cases have been reported. They include: (1) bilateral renal emboli,[11] and (2) bilateral thrombosis of renal artery and/or vein.[12]

4. *Acute Glomerulonephritis (and other Hypersensitivity States)*

The indication for dialysis is still uncertain. Because of the occurrence of spontaneous resolution in most cases of

glomerulonephritis, the artificial kidney should be used only when biochemical disturbance threatens life. Merrill[13] has observed that some patients fail to do well despite an excellent biochemical response.

5. *Acute Pyelonephritis*

Acute pyelonephritis rarely causes acute renal failure. If associated with diabetes it may produce severe renal medullary necrosis (necrotizing papillitis). When pyelonephritis occurs as a complication of polycystic kidneys, it may result in oliguric renal failure which may require dialysis.

6. *Postrenal Obstruction*

Apart from the postrenal obstructive conditions arising extrarenally (including calculous obstruction with so-called reflex anuria) there is an uncommon group which for convenience may be termed intrarenal obstruction. Renal tubular obstruction may accompany the ureteric obstruction attributable to sulphonamide[14] and uric-acid crystals (treatment for leukaemia with TEM,[15] irradiation[16] and nitrogen mustard[17]).

B. **Chronic Renal Failure**

In this group cases must be carefully selected. Complicating factors may precipitate acute renal failure, and there is always a possibility of recovery from such an acute episode (illustrated in Fig. 1).

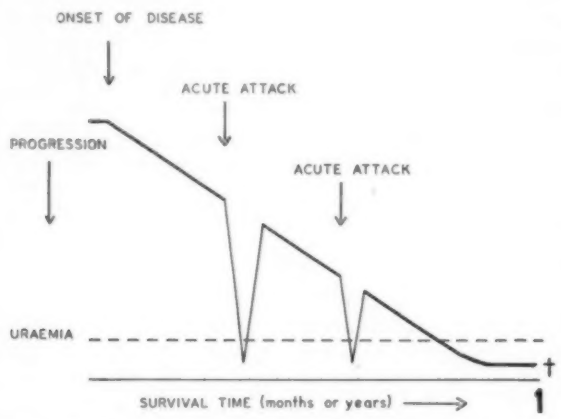

Fig. 1. Illustrating the effects of 2 acute episodes in the course of chronic renal disease. For simplicity, recovery is shown as a return to the original line of progress.

Dialysis during an acute episode may be followed by a remission allowing the patient months or even years of happy productive life. The course of polycystic kidneys, in particular, is a prolonged one, except when complicated by some acute illness, commonly pyelonephritis.

It is very difficult to estimate the degree of progression in any individual patient. Useful aids are a careful history (including details of drugs), any previous assessment of renal function, including glomerular filtration rate, microscopic examination of the urine for evidence of an acute nephritic process or of urinary infection, and radiological evaluation of the size of the kidneys. This X-ray investigation is particularly helpful and is too frequently omitted. Small kidneys suggest chronic disease. Renal biopsy, too, may be of value and patients have been prepared for this procedure by dialysis.

In this chronic group there is always the danger of post-dialytic oliguria. This has been attributed to a decreased total serum osmolarity, resulting mainly from reduction in the blood-urea concentration. The oliguria has been prevented by dialysing against a bath fluid with a high urea concentration.[18]

Some cases of chronic renal failure may be partially reversible, and these include the following:

(*i*) *Metabolic*—hypokalaemic syndrome,[19] and hypercalcaemia (hyperparathyroidism, sarcoidosis, hypervitaminosis D, myeloma).

(*ii*) *Unilateral renal disease*—uraemia in this group usually means advanced disease of *both* kidneys. It is doubtful whether it is ever reversible.

(*iii*) *Drugs*—e.g. phenacetin, sodium bicarbonate (milk-alkali syndrome).

These cases can usually be managed conservatively by treating the cause. When the patient is already dangerously ill and the diagnosis is in doubt, dialysis is essential. Furthermore, it may enable a necessary operation to be performed.

However, there are ethical considerations. Where the patient has reached the terminal stage of the disease it is open to question whether dialysis is justifiable. This can be a very difficult decision and each case must be treated on its merits, especially in view of the promising advances in the field of renal homotransplantation.[20]

C. **Systemic Intoxications**

The incidence varies from centre to centre. We had no cases in our series. In this group the danger is not failure of renal excretion, although some of the drugs may also be nephrotoxic. The artificial kidney removes dialysable toxic substances (e.g. salicylates, barbiturates and bromides) more rapidly than the normal kidney. It is the treatment of choice where the severity of the intoxication threatens life. This is especially so in aged infirm patients with severe associated disease; the hazards of protracted immobilization include respiratory infections and feeding difficulties and may be avoided by early dialysis.[21]

D. **Hepatic Failure**

Ammonia intoxication is believed to play a part in terminal hepatic failure and in the recurrent acute hepatic failure of chronic hepatic disease. Two special precipitating causes are of importance: (1) Ammonia intoxication from ingestion of protein in the diet, or administration of ammonium chloride, and (2) gastro-intestinal haemorrhage. Ammonia is dialysable[22] and, with regional heparinization,[23] dialysis may be feasible in the cases where sudden accumulation of large amounts of blood in the gut may be responsible for severe ammonia intoxication. Dialysis is of limited value in hepatic failure, but associated uraemia would be an added factor in favour of the procedure.

E. **Intractable Oedema**[24]

While treatment of overhydration in acute renal failure

is successful, the removal of fluid by ultrafiltration in cases with severe intractable oedema has been only partially successful, the fluid often re-accumulating.

THE OPTIMUM TIME FOR DIALYSIS

The artificial kidney has its main use in treating acute renal failure caused by acute tubular necrosis. Many of these patients do not require dialysis with an artificial kidney, but in the early phase of oliguric renal failure it is not always possible to predict in which cases dialysis will be necessary — hence prompt transfer to a renal centre is essential.

Clinical and biochemical criteria vary in different centres, but there is general agreement that clinical assessment is more important except when severe hyperkalaemia is present. Usually, however, in severe hyperkalaemia clinical deterioration has occurred. Severe overhydration from previous mismanagement is an indication for urgent dialysis. Early evidence of deterioration (clouding of consciousness) should be heeded and dialysis should not be delayed until nausea, vomiting, stupor, and convulsions have developed. Biochemical indices are of assistance in deciding the optimum time for dialysis: (1) blood urea > 300 mg. per 100 ml., (2) serum potassium > 7 mEq./l., and (3) serum carbon dioxide < 12 mEq./l.

There is general agreement concerning the serum-potassium and CO_2 levels, but the blood-urea levels cited by others as indications have been higher — in the region of 400 mg. per 100 ml.[5,9,25]

While the abovementioned biochemical findings suggest the advisability of dialysis, it must be remembered that none of these figures is an absolute indication in itself, and must be considered in conjunction with the clinical state of the patient.

Daily investigation of the blood-urea level is a valuable guide to the management. However, the absolute blood-urea level is less important than the daily rate of increase, and may enable the probable day of dialysis to be fixed in advance. Any acceleration in the relatively constant daily increase in blood-urea concentration should be noted.

CONTRAINDICATIONS

Apart from free gastro-intestinal bleeding, there are virtually no contraindications to dialysis. However, unnecessarily early or frequent dialyses in cases of mild to moderate severity, and ill-considered and misguided effort in hopeless chronic cases should be avoided. Even the possibility of profuse bleeding need not be a contraindication to dialysis, since regional heparinization is an established technique[25] in some clinics. Bleeding is not generally a major hazard to successful dialysis. It should be noted that, despite the fears of many, heparinization does not seem to result in further bleeding.

RESULTS

In the course of management of 55 patients with acute renal failure, 30 have been treated with the artificial kidney. A further 5 patients with chronic renal failure have undergone dialysis. The results are shown in Table II.

We think it is important to divide cases of acute tubular necrosis into two groups, since the course and prognosis are vastly different in these groups. Many reports do not make this differentiation and erroneous conclusions have been reached.

Most important is the time of transfer of potential cases for dialysis to centres with artificial-kidney units.

TABLE II. RESULTS OF TREATMENT IN 60 PATIENTS WITH RENAL FAILURE

	Patients	*Dialysed*	*Died*	*% Mortality*
Acute renal failure:				
Group I:				
Obstetric ..	25	16	5	20
Nephrotoxic ..	2	1	0	0
Miscellaneous..	8	4	3	37
Total ..	35	21	8	23
Group II:				
Postoperative..	13	5	7	54
Post-traumatic	7	4	6	86
Total ..	20	9	13	65
Chronic renal failure	5	5	5	100

Note: (1) In 4 of the acute cases the renal lesion was irreversible—3 patients with bilateral cortical necrosis and 1 with 'failed reflow' kidney.
(2) Six of the acute, and 1 of the chronic, cases were dialysed twice.

TABLE III. RESULTS OF TREATMENT OF VARIOUS TYPES OF ACUTE RENAL FAILURE FROM 5 CENTRES *

	Total	*Dialysed*	*Died*	*% Mortality*
Group I:				
Obstetric:				
Philadelphia ..	16	7	4	25
Albany ..	10	5	0	0
Hammersmith	20	11	4	20
Leeds	25	17	2	8
Cape Town ..	25	16	5	20
Nephrotoxic:				
Philadelphia ..	9	2	5	55
Albany ..	9	7	2	22
Hammersmith	6	2	1	17
Leeds	1	1	0	0
Cape Town ..	2	1	0	0
Intravascular haemolysis				
Philadelphia	24	16	7	29
Albany ..	4	2	0	0
Hammersmith	—	—	—	—
Leeds ..	3	0	0	0
Cape Town	—	—	—	—
Miscellaneous:				
Philadelphia ..	13	4	6	46
Albany ..	—	—	—	—
Hammersmith	10	4	3	30
Leeds	9	8	4	44
Cape Town ..	8	4	3	37
Group II:				
Postoperative:				
Philadelphia ..	32	18	23	72
Albany ..	40	23	28	70
Hammersmith	45	23	37	82
Leeds	18	14	14	77
Cape Town ..	13	5	7	54
Post-traumatic:				
Philadelphia ..	6	4	5	83
Albany ..	17	12	9	53
Hammersmith	29	16	22	76
Leeds	7	5	4	57
Cape Town ..	7	4	6	86

* Centres are the same as in Table I.

The best results are obtained with early dialysis in a comparatively well patient; the transfer of a desperately ill patient well into the oliguric phase (although sometimes unavoidable) is too often encountered. In such circumstances poor results can be expected. With regard to acute tubular necrosis in the uncomplicated group I case, the course can be predicted from the daily rise in blood urea (usually < 30 mg. per 100 ml.) and with the knowledge that the average duration of the oliguric phase is 12 days.[1,9,26] In the group II case with accelerated uraemia (> 50 mg. per 100 ml. per day) the course and prognosis is quite different, and hyperkalaemia and uraemia are often marked before the end of the first week; here dialysis is often required before the fifth day.

Selection of cases in artificial-kidney centres is inevitable; a hospital becomes known for its artificial-kidney unit and patients are referred there for special management. Control series are therefore not adequate. Although there is considerable difficulty in assessing results, comparison of the results from several centres shows a surprising uniformity (Table III).

As a generalization, it can be said that the mortality of the 'medical' group I case has been considerably reduced since the introduction of the conservative régime with the intelligent use of the artificial kidney. This is especially seen in the obstetric group, except where infected abortion has made peritonitis and septicaemia (often with *Cl. welchii* infection) additional hazards. Despite the frequency of these factors in our series, the mortality rate of 20% compares favourably with that of other centres. The mortality remains high in the 'surgical' group II case of acute tubular necrosis, but better results have been achieved by Parsons *et al.*[27] by using a machine with a larger dialysing surface and instituting dialysis when the blood-urea nitrogen was 120 - 150 mg. per 100 ml. Previously, a level of 180 - 200 mg. per 100 ml. (blood urea 385 - 428 mg. per 100 ml.) was used as an indication. It is in this group, with a daily rise of blood urea exceeding 50 mg. per 100 ml., that the advantages of prophylactic haemodialysis[26] need to be established.

SUMMARY AND CONCLUSIONS

In general, indications for dialysis with an artificial kidney include acute, and some cases of chronic, renal failure, certain systemic intoxications, and possibly hepatic failure and intractable oedema. In deciding the optimum time for dialysis, biochemical criteria are important, but must be considered in conjunction with the clinical status.

The commonest cause of acute renal failure is acute tubular necrosis. These cases may be divided into groups I and II according to the course and prognosis, the group II cases having accelerated uraemia with a poorer prognosis despite early dialysis. The experience at Groote Schuur Hospital over a 2-year period is presented.

The importance of recognizing and treating a precipitating cause in chronic renal failure, and the rôle of dialysis in some of these patients is stressed.

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A DISCUSSION OF CAUSES OF ERROR IN THE DETERMINATION OF CHRONOLOGICAL AGE IN CHILDREN BY MEANS OF X-RAY STUDIES OF CARPAL-BONE DEVELOPMENT

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Following the introduction of X-rays at the beginning of the present century, extensive research has been conducted in many countries into the ossification of skeletal bones. These studies have shown that there is a definite sequence in the appearance of centres of ossification and that the time of their appearance follows a fixed pattern.

The age at which these centres appear is earlier in females than in males. According to Köhler[1] the difference in the postnatal ossification rate of the skeletal parts during the first 5 years of development is so marked in boys and girls that differences of even as much as 2 years in the appearance of the ossification centres may be found

TABLE I. AGE AND RELATIVE ORDER OF APPEARANCE OF CARPAL CENTRES OF OSSIFICATION IN CHILDREN AS FOUND BY DIFFERENT INVESTIGATORS IN THE USA AND CENTRAL EUROPE

Ossification centre	Flory				Greulich and Pyle				Siegert						Schinz and Baensch	
	Female		Male		Female		Male		Female			Male			Female and male	
	Months	Order*	Months	Order	Months	Order	Months	Order	Months	Average months	Order	Months	Average months	Order	Months	Order
Os capitatum	6	1	6	1	3	1	3	1	2		1	4		1	3	1
Hamatum	6	1	6	1	3	1	3	1	4		2	5		2	4	2
Epiphysis radii	9	2	15	2	12	2	18	2	8-11	9½	3	15-18	16½	3	18	3
Triquetrum	23	3	24	3	24	3	36	3	32-35	33½	4	33-36	34½	4	36	4
Lunatum	36	4	42	4	42	4	42	4	40-48	44	5	48-50	49	5	48	5
Multang. major	50	5	72	5	50	5	60	5	48-54	51	6	55-72	58½	6	60	6
Multang. minor	53	6	73	6	52	6	75	7	48-54	51	6	56-72	64	7	60	6
Naviculare	56	7	72	5	52	6	72	6	54-59	56½	7	60-72	66	8	60	6
Epiphysis ulnae	68	8	80	7	78	7	78	8	65-72	68½	8	74-85	79½	9	72	7
Pisiforme	108	9	140	8	108	8	120	9	93-129	111	9	109-138	123½	10	120	8

* In cases where the same number occurs more than once in the same column, the particular carpal bones concerned appear at the same time.

between the sexes during this period. He concluded that, even though girls are smaller than boys, the ossification centres appear earlier and develop more rapidly in females than in males.

In the case of the carpal bones the appearance and development of the centres of ossification take place only after birth. Only a delicate cartilaginous structure is present at birth, from which the ossification centres develop.

Studies on the time of appearance of the carpal bones and on the differences in this respect between males and females have been made by a number of investigators. The findings of 2 American and 2 European research groups with regard to the age and relative order of appearance of the carpal ossification centres are summarized in Table I. Flory's[2] data and those of Greulich and Pyle refer to White American children. The figures of Siegert and Schinz-Baensch are considered satisfactory by Köhler for European conditions, but he also approves of Flory's data. The *Radiographic atlas of skeletal development of hand and wrist* by Greulich and Pyle[6] is also very useful.

If bone development in the prepubertal stage proceeded undisturbed by external or internal factors, it would naturally not be difficult to estimate chronological age from bone age. The determination of chronological age can be of importance for research purposes and is also of use to pathologists, radiologists, and workers in medical jurisprudence (e.g. in court cases). While, however, the ages at which the carpal bones appear are taught to students almost as a law, it should be noted that deviations from the normal plan of development of the carpal bones do occur. Such deviations may lead to confusion and faulty diagnosis of the chronological age.

Examples of deviations observed in the course of nutritional-status surveys carried out by the National Nutrition Research Institute are shown in Figs. 1 - 3. In Fig. 1 the presence of only 3 carpal bones would suggest, according to the usually accepted standards, an age of only 2 years 9 months (i.e. an error of 4 years). In Fig. 2 the state of development would indicate an age of 7 years 10 months, whereas the subject was only 6 years 9 months old. In Fig. 3 the presence of the os capitatum, os hamatum, and os triquetrum indicates an age of 2 years 6 months, while the stage of development of the epiphysis ulnaris indicates an age of 6 years 3 months. The subject was 5 years 4 months old.

It must be mentioned at the outset that certain pathological abnormalities of the wrist joint occur owing to such factors as congenital endocrine disturbances, pre- and postnatal infections, traumatic and parasitological conditions, osteoporosis, osteosclerosis, and benign and malignant neoplasms. These pathological conditions, however, present characteristic radiological features and will not be further discussed here, since they are primarily of pathological interest.

Fig. 1. Gross retardation of carpal-bone development in a male White child aged 6 years 9 months.
Fig. 2. Acceleration of carpal-bone development in a female Bantu child aged 6 years 9 months.
Fig. 3. Retardation and acceleration of carpal-bone development in a female Bantu child aged 5 years 4 months.

While most American investigators have reported little or no difference in carpal-bone development between the 2 sexes, we have found evidence of minor sex differences in the development of the carpal bones in approximately 18 - 20% of the Bantu and European children studied in our surveys. We have also found that the ossification is not always symmetrical and that in some cases there is a difference in development between the 2 hands (up to 6 months). The last-named differences are too small, however, to be of practical importance in the determination of chronological age. Köhler[1] has made the interesting remark that, according to Wilms and Göttsche, the ossification centres show advanced development in cases of tuberculosis and that this is more marked in the wrist of the affected side of the body than in that of the healthy side.

ABNORMALITIES

The main abnormalities which we have found to hamper the determination of chronological age by means of the state of carpal-bone development are listed and discussed below.

1. *Retardation of Carpal-bone Development*

An example of this condition is shown in Fig. 1. Factors which may be responsible include: constitution, race, environment, climate, insufficient light, physical inactivity, inadequate supply of fresh air, hypophysial dwarfism, hypogonadism, eunuchoidism, cretinism, thyreoprivism, hypothyroidism, diabetes mellitus, Addison's disease, deficiency of minerals in the diet, rickets, chronic suppurations, severe illness, neurovascular defects, neurological aberrations, coeliac disease, protein loss, and, according to Gillman and Gillman,[7] serious undernutrition or malnutrition.

According to Flory[5] there is no doubt that severe physical disorders can interrupt the rhythm of a child's development. On the other hand, however, he wrote: 'Yet developmental disruptions occur, when no physical symptoms can be attached to the break in growth-rate'.

Flory[5] studied, individually, 15 schoolgirls who showed sharp breaks in skeletal development. Eight of these girls had suffered from one or more of the following diseases: whooping cough, neurodermatitis, measles, glandular dysfunctions, unhealthy tonsils, chronic constipation, nervousness, repeated colds, persistent fatigue, headaches, rheumatic fever, bronchitis, laryngitis, and malnutrition. He remarked: 'Any one of these disorders might conceivably slow up the ossification temporarily. Recovery from illnesses requires a short or long period and may be even several years of time'.

2. *Acceleration of Carpal-bone Development*

For an example see Fig. 2. In this case constitution, race, hypophysial gigantism, precocious puberty, tumours of the pineal body, thyrotoxicosis, chronic suppurations, adrenal tumours, and rheumatic fever may be responsible.

3. *Acceleration and Retardation in the same Carpal-bone Area*

An example is shown in Fig. 3. The identity of the factors responsible is not clearly known, but the possibility exists that the occurrence of conditions of chronic undernutrition or malnutrition or continuous loss of protein, simultaneously with chronic infections or rheumatic fever, may contribute to the appearance of such phenomena. Further research will be necessary in this direction in order to determine the causes of these anomalies.

4. *Other Abnormalities Observed*

Abnormalities have been observed in our studies with regard to: (*a*) the sequence of carpal-bone development, (*b*) the presence of additional carpal bones, (*c*) the presence of supernumerary epiphyses, (*d*) the presence of synostosis, and (*e*) notch formation at the radial side of the os capitatum.

It has been suggested[8] that genetic factors may be responsible for abnormalities (*a*) - (*d*) above. An abnormality which appears to be similar to (*e*) has been described by Beresowski and Lundie.[6] It is suggested that genetic factors may also be responsible here.

It seems unlikely that abnormalities (*a*) - (*e*) can have any important effect on the determination of bone age, but further knowledge is required on this aspect.

THE INTERPRETATION OF 'GROWTH LINES' IN THE DISTAL METAPHYSIS OF THE RADIUS

The significance of these so-called 'growth lines' in proximity to the epiphysial cartilage is still somewhat obscure. Archer[9] has commented that single, thickened, transverse lines of increased density at the ends of the shafts, from an excess of calcified primary cartilage, may be caused by any growth disturbance, but he did not consider them as pathognomonic of any particular disturbance. Köhler[1] and others hold the same opinion. A number of conditions are known, however, in which growth lines appear, for instance after rickets, especially when an excess of vitamin D has been administered, and in congenital scurvy, syphilitic infections, osteitis, osteomalacia, fragilitas ossium, neurofibromatosis, Paget's disease, fractures, lead poisoning, parenteral bismuth therapy of the mother while pregnant, bacterial infections, and foetal erythroblastosis.

These observations suggest that 'growth lines' may be an indicator of previous physical disorder. Our own observations also suggest that growth lines occur more frequently in subjects showing other deviations in bone development than in subjects with normal bone development. Growth lines in themselves, however, are unlikely to cause error in the determination of chronological bone age. They should be considered as temporary interruptions of longitudinal bone growth during early childhood.

X-RAY DETERMINATION

Photographic Technique

The technique is of importance if bone age is to be determined accurately. We have found that attention must be paid to the following points:

1. 'Standard position'. The long axis of the third metacarpal must be in the extension of the long axis of the forearm.

2. The saggital dorso-volar ray direction must be used.

3. The axis ray must be perpendicular to the Carter 'quadrilateral'[3] and pass through the 'cross line' (Fig 4).

4. In order to bring the volar surface of the wrist as closely as possible to the surface of the film and parallel to it, the fingers must be held relaxed, but in a slightly flexed position.

Fig. 4. Diagram showing 'quadrilateral' and 'cross line' of Carter.[3]
—— = quadrilateral.
- - - = cross line.

5. The child must be seated on a chair while the film is exposed, and the height of the seat must be such that the forearm and the upper arm are at an angle of 90° to each other. The whole arm must be flat on the table and must be immobilized with sandbags.

6. Both wrists must be X-rayed.

7. The time of exposure must be on the 'soft' side for the sake of visualization of ossification centres which radiologically are hardly visible before calcification.

8. The time of exposure must be the same for both hands.

9. The distance from the focal point to the hand must not be less than 100 cm., to prevent distortion.

Assessment of Bone Development

No completely reliable method is as yet available for the determination of bone development. For the general purpose of X-ray diagnosis of the carpal bones the 'qualitative inspection technique' is a rapid method, by means of which the experienced specialist can obtain a good impression of the state of the skeletal elements of the hand. It must be remembered, however, that the interpretation is subjective and may lead to differences in the evaluation.

Two other methods which have been proposed for the determination of carpal-bone growth are the 'skeletal month rating method' of Flory[2] and the 'ossification rates method' of Carter.[3,4] In addition, many other research workers have studied the subject of carpal-bone development and have given descriptions of several other possible techniques for the determination of carpal-bone growth.

On the basis of a study of more than 2,500 X-ray photos of wrist joints of White and Bantu children of both sexes, we have come to the conclusion that the simple inspectional interpretation of X-ray films of the wrist is not satisfactory unless previous history, somatometry, results of general medical examination, and possibly the mental condition and other particulars are taken into consideration.

The indications as to height and weight and clinical and mental condition often give a reasonable indication of the general state of bone development in a patient. A complete history can also give valuable information and should, if possible, begin with sociological data, illness in the family, the antenatal period of the individual, including the birth itself, and the postnatal period, with particulars of diet and diseases.

Special Conditions found in South Africa

There are several reasons why particular difficulty is likely to be encountered in South Africa in the determination of chronological age by means of X-ray studies of carpal-bone development. These include the following:

1. The White population of South Africa is composed of several population groups with their origin in Europe. The inhabitants of the European continent are descendants of different human races which are classified by Günther[10] as follows: Westphalian, Nordic, Dinaric, Blond- and Dark-Alpine, and Atlantic races. All these have contributed to the White population of South Africa.

2. The non-European population of South Africa is made up of various racial groups, e.g. the Bantu, Indians and Malayans, with mixtures of all these and Whites, generally termed the 'Coloured' group.

3. Considerable social differences exist between the different sections of the population.

4. There are differences in diet and food habits between the various groups of the population.

5. Differences may occur with respect to environmental factors, such as climate and exposure to diseases (e.g. bilharzia, malaria, amoebiasis, fluorosis, and goitre) in certain areas of the country.

In conclusion, it can be said that, unless the history, nutrition, somatometry and clinical findings are taken into consideration, misleading conclusions can be reached or a diagnosis of the chronological age even rendered impossible in cases such as that illustrated in Fig. 3.

SUMMARY

Certain difficulties and sources of error in the determination of the chronological age in children by means of the state of carpal-bone development are discussed with special reference to South African conditions. Abnormalities of carpal-bone development, the presence of which can be a source of error, are described and factors responsible for their occurrence are discussed. Attention is drawn to certain details of technique and interpretation which have been found important. The need for a consideration of factors such as history, nutrition, somatometry and clinical findings is particularly stressed.

Thanks are due to Prof. C. J. N. Loubser and Dr. J. M. van Niekerk of the Medical School, University of Pretoria, for their interest and advice; and to Dr. W. I. M. Holman of the National Nutrition Research Institute for help in connection with the preparation of this article.

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OBSERVATIONS ON HUMAN BRUCELLOSIS IN GENERAL PRACTICE

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This paper is a review of the findings and observations I made in the treatment of human brucellosis during 11 years in private practice as a general practitioner in South West Africa. Over this period I treated an estimated 350 - 500 patients with this disease, from an area of more than 80,000 square miles.

Geographical Distribution

Brucellosis is a widespread disease in South West Africa and a very frequent cause of ill health, both in man and animals. Although found in every part of the territory, it occurs mainly in the southern half and north-western section where karakul farming is almost the sole industry.

Animal Incidence

Cattle, pigs, goats and sheep are all subject to infection. Of all domestic animals in the territory the' karakul is, without doubt, the main carrier. In newly infected flocks the disease may cause up to 60% of premature or full-term stillbirths for 2 - 4 lambing seasons, after which the ewes, although still infected, give birth to live offspring at term.

Human Incidence

No age is immune, but in the absence of a proper survey it is futile even to guess at the amount of human brucellosis in highly endemic areas. However, on a single farm 4 members of a family of 9, together with 2 African shepherds out of 3, were found to suffer from Malta fever at approximately the same time as an entire family of 5 on another farm 130 miles away. It seems obvious to me from these findings that the incidence of the disease is far higher than is generally recognized.

Mode of Infection

In animals the disease is transmitted venereally. Whether or not this is the main or only route of transmission I do not know. Orthodox teaching states that man acquires the disease by ingesting infected dairy products or meat, of which goat's milk appears to be the chief offender. In South West Africa this is not true. The high incidence of human brucellosis in the territory undoubtedly results from the handling of highly infective material, such as newborn lambs or recently skinned pelts. The apparent predilection of the disease for karakul farmers, compared with cattle or goat farmers, could not be explained otherwise.

Moreover, I have a strong suspicion that in man transmission by the venereal route is likewise possible—a conclusion arrived at after close questioning of several female patients who had neither handled infective material nor ingested possibly infected dairy products, but whose husbands were known to suffer from Malta fever.

Symptomatology

In the acute and subacute stages the main signs and symptoms, viz. fever, malaise, painful swelling of one or more of the large joints, swelling of the liver and/or the spleen, and unilateral disabling sciatic pain, are almost identical in man and animal.

In newly infected flocks of sheep, for instance, a considerable number are often observed to be temporarily lame in a hind leg. In my own experience, intractable pain in the hip was so common that a patient presenting with such a complaint was investigated serologically as a matter of routine unless some other cause for the pain was demonstrable.

Pain and swelling of a knee joint is common enough to be borne in mind as a possible sign of Malta fever. Some obviously chronic cases present with annually recurring acute arthritis of a knee joint—almost invariably confined to the same knee year after year, even when the systemic infection has long been burnt out and serological reactions have been negative for years.

Onset of the disease may be sudden, and is then easily recognized. On the other hand, it may be so insidious that the patient is often unaware of being infected for months or even years. In a disease of such protean character even those well versed in its deceptiveness sometimes find it impossible to recognize it for what it is. The following are two cases in point:

1. Mr. M., a European male aged 46. Seen by chance when his car broke down on the way to the coast where he had been sent by his doctor to receive further treatment for acute cardiac failure. The findings were: Heart grossly enlarged, with to-and-fro murmurs at all valvular areas. Hepatomegaly and splenomegaly. Blood smear for malaria negative.

I was asked to examine the patient's second youngest child who presented with fever and was thought to have caught a cold. The child's liver was grossly enlarged. This made me suspect Malta fever and the patient's wife and other two children were, therefore, also examined. In the children unmistakable signs of Malta fever were found. No clinical signs were detectable in the mother. For confirmation the blood sera of the husband and wife were forwarded to the South African Institute for Medical Research and strongly positive reactions were eventually returned in both cases. Treatment of the family was started forthwith, and Mr. M.'s cardiac condition cleared up. He returned to his farm without proceeding to the coast.

2. Miss de B., a European schoolgirl aged 14. No previous illnesses and no preceding symptoms. She unexpectedly collapsed in the classroom with epileptiform fits, and was rushed to hospital where her doctor described the fits as Jacksonian in type. A tentative diagnosis of a space-occupying brain tumour led to arrangements for transfer to Groote Schuur Hospital. The patient improved in hospital and was sent home to await transfer to Cape Town. I was asked to keep her under observation. Since her mother and two younger brothers were at the time still under treatment for Malta fever, I forwarded her blood serum to the SAIMR. A positive reaction was returned of 1 in 7,200 for *Br. melitensis* and 1 in 3,200 for *Br. abortus*. Treatment was started immediately and the condition cleared up completely. There was no recurrence.

Effect on Pregnancy

The following cases are reported for consideration:

1. Mrs. R., a European female aged 33. Married 6 years. No children. 3 previous miscarriages in October 1947, July 1948, and August 1950. A suspicion that strong retroversion and retroflexion of the uterus had been responsible for the abortions had led to ventral suspension of the uterus in November 1950. The Wassermann reaction was repeatedly negative.

Fertilization occurred for the fourth time in August 1952. She consulted me for the first time when she was 10 weeks' pregnant and had just commenced bleeding again. All the previous

pregnancies had terminated spontaneously at 6 - 8 weeks. On this occasion she aborted at 10½ weeks in spite of treatment in hospital.

The patient's husband had been vaguely ill for some years and had been treated for acute Malta fever in 1951. Although she herself had never complained of illness, her blood serum was forwarded for investigation some 8 days after she had aborted for the fourth time. The SAIMR returned a positive finding of 1 in 6,400 for *Br. melitensis* and 1 in 1,600 for *Br. abortus*.* She was given a full course of 'chloromycetin' in January 1953, with an initial dosage of 75 mg. per kg. bodyweight, to a total of 36 G. She fell pregnant again in August 1953 and had an uneventful pregnancy, ending at term on 6 May 1954.

2. Mrs. M., a European female aged 37. Married 14 years with 4 children and no previous miscarriages. She aborted spontaneously, with massive, almost fatal, haemorrhage at approximately 8 weeks, in October 1954. The uterus was evacuated by curettage. Subsequently she developed metrorrhagia which gradually became worse, until curettage was repeated in the belief that some product of gestation had remained behind. The second curettage yielded nothing abnormal. Concomitant symptoms led to the suspicion of Malta fever. Serological investigation, completed on 13 July 1955, yielded a titre of 1 in 400 for *Br. melitensis*. The test for *Br. abortus* was negative.

I can recall several other patients with a history of repeated spontaneous abortions in which serological investigation confirmed a diagnosis of brucellosis. One of these, too, an African woman, gave birth to a live baby subsequent to treatment.

Long-term Effects

Untreated brucellosis in man is seldom fatal, but is always a long-drawn-out affair; the most crippling long-term effect being recurrent acute arthritis in the knee or hip joint. Even where no permanent disablement results, the untreated or inadequately treated patient remains a person of low physical productivity for a long time.

TREATMENT

In view of the foregoing, it is, in my opinion, important to treat Malta fever quickly and energetically as soon as the diagnosis is established. Here I want to stress the fact that my observations were made in a region more than a thousand miles from the nearest laboratory, where communications were as uncertain as one could imagine. Consequently, after sufficient experience in practice, I seldom waited for serological confirmation of the clinical diagnosis. The patient was usually back at work before the serological results were known.

Various methods of treatment were tried, with sulphonamides, streptomycin, and broad-spectrum antibiotics all taking their turn as they became available. I found chloromycetin to be the drug of choice. In the dosage advocated it is better tolerated, and will cure brucellosis faster and more lastingly than all the others I tried. I am well aware that exponents of other antibiotics may challenge this statement. I can only reiterate that these were personal observations, and that by a method of trial and error certain conclusions forced themselves upon me.

Chloromycetin should be used in massive doses from the outset to ensure destruction of the organisms. The patient must be weighed and the course commenced with 75 - 100 mg. per kg. bodyweight per day in divided doses at 4- or 6-hourly intervals. This high initial dosage is decided upon arbitrarily according to the clinical severity of the case and maintained until the temperature approaches or reaches normal, which usually occurs within 48 hours. At this stage the dosage is reduced by 500 - 1,000 mg. per day, depending upon the response of the patient. Levelling-off occurs at 1,000 mg. per day and this is maintained until the patient has been afebrile for a week. For children under 12 years of age, the final dosage level depends to some extent on the weight, but should never be lower than 500 mg. per day. For the adult, the total dosage varies between 25 and 40 G., being lower or higher at the opposite ends of the age scale.

With this régime the number of relapses, in my experience, were few indeed, and I cannot recall a single patient who developed a toxic reaction to the drug, nor did I ever have a case of intolerance, although I had been told in the past that chloromycetin in such doses may be dangerous.

Socio-economic Aspects of Treatment

In private practice the patient expects to be returned to duty at the earliest possible date. The quicker an infection is knocked out, the sooner the patient will be out of hospital and back at work. The course of treatment should last approximately 10 days and not 10 weeks. Accordingly, the use of an expensive drug in massive doses is justified by the absolute minimal period of incapacity of the patient. A final case is quoted to illustrate this point:

Mr. B., a European farmer aged 54. Admitted to hospital in September 1951. The patient had been receiving treatment with streptomycin, 'terramycin' and 'aureomycin' for more than two months in two different hospitals. On admission his condition was extremely poor, and he was unable to walk. He was seen in consultation a day or two after admission. Medication was switched over to the régime advocated above. Response was dramatic and the patient made a complete recovery in 14 days. Owing to his very poor initial condition he stayed in hospital for three weeks.

CONCLUSION

1. Experience gained from treatment of a large number of patients has taught me that chloromycetin, if administered in adequate amounts, is the drug of choice in the treatment of human brucellosis. The reasons for this I do not know, but to me there seems to be some relationship between its effect on typhoid and paratyphoid organisms on the one hand, and brucella organisms on the other.

2. Apart from the oral route of infection, I am convinced that the mere handling of infective material is sufficient to transmit the disease from animal to man, although it is possible that even then infection takes place *via* the gastro-intestinal tract. In addition, however, I would suggest that transmission by the venereal route is possible.

3. I have long had a suspicion that brucellosis in the human female may have an effect on pregnancy similar to that in animals. I have never been able to understand the argument that an organism which affects humans and animals alike in all other respects, is said to cause spontaneous abortion in animals only. Admittedly, it is unwise to draw inferences from such a small number of cases. Nevertheless, it is significant that work done in England some years ago by a bacteriologist (later attached to the South African Bureau of Standards), revealed that about 20% of placentas from a series of spontaneous abortions in an endemic area were found to show positive agglutination tests. It is my belief that brucellosis cannot be entirely disregarded as a cause of spontaneous abortion in humans,

* SAIMR reference no. 249437 dated 27 November 1952.

and the matter should receive closer attention from research workers and medical practitioners in endemic areas.

4. Finally, I wish to point out that these are personal observations, the interpretation of which I leave to those who are better qualified to assess or determine their validity or scientific value.

For his encouragement, I wish to thank Dr. F. E. Hofmeyr, of the College of General Practitioners in Cape Town, at whose request this paper has been written.

CAPILLARIA IN MAN

A CASE REPORT

S. KALLICHURUM, M.B., CH.B. (NATAL), *Department of Pathology, University of Natal,* and R. ELSDON-DEW, M.D., F.R.S.S.AF., *Amoebiasis Research Unit,* Institute for Parasitology, Durban*

Invasion of unusual hosts by parasitic species must be a very common occurrence, but probably the great majority of such invasions are doomed to failure at the outset. However, there are quite a number of infestations in which the parasite, while having little chance of ultimate survival, is able to proceed through part at least of its life cycle, and possibly cause pathology in its unusual host.

Some of these are well known in man, and have come to be accepted, without appreciation that the normal host-parasite balance no longer applies, and such pathology as may arise may well be different from that which occurs in those hosts able to sustain the parasitic species.

Well-known examples of a parasitic species reaching a dead-end in man are invasion with such parasites as *Trichinella spiralis, Echinococcus granulosus* and the cysticercus stage of *Taenia solium*. In these (group I) the larvae reach a stage which would be infective to a subsequent host, and, were it not that humans are seldom eaten, the cycle would be completed. In the case of invasion by the larval stages of *Ancylostoma braziliense* (causing 'sandworm') and *Toxacara canis* (one of the causes of visceral larva migrans), the parasite is unable to reach maturity, and thus the cycle is not completed (group II). In a third group, the parasite, having found itself in a host unsuitable for further development, merely lies up in the hope that such an unsuitable host may be eaten by the right host. Such paratenesis is not uncommon in Pseudophyllidea like *Dibothriocephalus latum*, but may also occur in some nematodes. An interesting example is that of *T. canis*, which, if it invades a bitch, may not complete its cycle, but will await pregnancy when it will traverse the placenta to continue its life in the newborn pup.

This report deals with invasion by *Capillaria hepatica*, which might be classed with the first group, though it has features of the third. Though less than a dozen of these cases have been reported, such infections must be not infrequent, in view of the close association between rat and man.

CASE HISTORY

An African female child, aged 5 years, was admitted to the fever ward of King Edward VIII Hospital, Durban, with a diagnosis of measles, bronchopneumonia and dysentery. Though stool examination showed pus, blood and mucus, culture was negative, and the only parasites found were *Ascaris lumbricoides, Trichocephalus trichiura* and *Trichomonas hominis*. There was no clinical evidence of liver disease and no blood count was done. The child died on the 6th day.

Necropsy, 3 days later, confirmed the diagnosis of measles, bronchopneumonia and non-specific colitis. The liver, of normal size, was studded throughout with gritty, yellow-white specks of 1 - 2 mm. diameter, at that time thought to be areas of calcification.

Section (Fig. 1) showed scattered and irregular foci of loose, cellular and, in part, necrotic connective tissue surrounding numerous ova and some remnants of worm. These foci were related to the portal tracts, and were sharply defined from the adjacent apparently normal liver tissue, which showed no distortion of architecture. In this lack of distortion this case differed from that of Cochrane *et al.*[1]

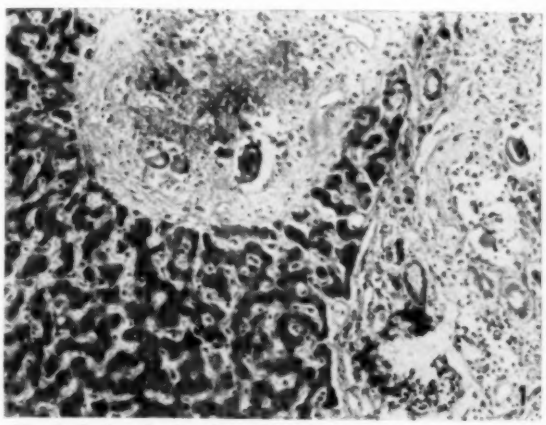

Fig. 1. Section showing the relationship of the worms and ova to the portal tract, and the lack of distortion of parenchymal architecture.

Fig. 2. Section of an ovum showing the opercula, the striations and the segmented embryo.

In the majority of foci, fibrosis was the prominent feature, inflammatory-cell infiltration not being marked. Most cells present were of chronic inflammatory type, with lymphocytes and plasma cells. There were but few eosinophils, in contrast to the findings in other parasitic infections.

The ova (Fig. 2) were round or oval (60×30 microns) in

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cross-section, and in appropriate sections non-protruding opercula could be seen. Between the inner and outer shells radial striations were prominent. The embryo was in many instances clearly segmented. These features serve to distinguish these eggs from those of Trichocephalus.

DISCUSSION

Capillaria (*Hepaticola*) *hepatica* (Bancroft, 1893) Travassos, 1915, is an aphasmid nematode primarily parasitic in the liver of rodents. Like those of its better-known relative, *T. trichiura*, its eggs must undergo a period of external development before being able to infect a new host. The appropriate conditions of temperature, moisture and availability of oxygen are similar to those required by the eggs of *Ascaris lumbricoides*.

Since the adults and the eggs are imprisoned in the liver, usually in connective tissue, it is difficult to conceive how the eggs reach the exterior, for they are seldom released in the faeces of infected hosts. It is now generally accepted that the eggs can only be released from the liver by putrefaction or by digestion in the gut of another animal, whether a carnivore or a scavenger. It has recently been shown[2] that the rodents themselves, being cannibals, perform this function. Thus, to complete the cycle, the parasite passes through 2 animals, the second merely freeing the egg from the tissue of the first and thus permitting the embryo to reach the environment necessary for its further development.

Thus infection of man with this parasite could not follow the eating of rats, but most likely results from the ingestion of rat faeces which have been exposed to the air for some time.

This is the second case of human infection reported in South Africa, the first being that described by Cochrane *et al.*[1,3]

SUMMARY

A case of human infection with *Capillaria hepatica* is described.

Our thanks are due to Dr. S. Disler, Medical Superintendent, King Edward VIII Hospital, and to Prof. J. Wainwright of the Department of Pathology, University of Natal, for permission to publish this case.

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EXFOLIATIVE CYTOLOGY CELL EXAMINATION: A PILOT EXPERIMENT

LEWIS S. ROBERTSON, *President of the National Cancer Association of South Africa*

Dr. Robertson recently made the following statement:

'It gives me great pleasure indeed to announce that, after months of negotiation, agreement has been reached in regard to a pilot experiment — the first to be conducted in South Africa — which will be organized jointly under the auspices of the Municipality of Brakpan and the National Cancer Association of South Africa. The object is to determine the average demand from South African women for exfoliative cytology smears to be taken in response to a concentrated public education campaign. The exfoliative cytology cell examination for uterine cancer is essentially a cancer-detection test, the material for which is simply, easily, quickly and painlessly taken.

Brakpan was selected for the experiment by virtue of the early interest and representations of the Medical Officer of Health, Dr. H. Bloomberg, in the project of a cancer-screening clinic and because it is regarded as an average South African urban area with a European female population over the age of 21 of approximately 10,000. All services will be rendered free to Brakpan women and no means test will be applied. All costs will be borne jointly by the National Cancer Association and the Municipality of Brakpan.

Uterine cancer, if discovered and treated early, is one of the most curable forms of cancer. At present only about 55% of uterine cancer cases are cured because they are usually already firmly established when detected. If the pilot experiment which we propose to conduct meets with the desired response from the adult female population, it may very well result in reducing cancer of the womb as a cause of death in Brakpan.

At the spearhead of the community-wide educational campaign in Brakpan will be the Association's film 'Time and two women' which is also available in Afrikaans under the title 'Tyd en twee vroue'. Descriptive pamphlets will also be widely distributed. Several screenings will take place at the municipal clinic daily from 8 a.m. to 8 p.m. during the month of November to enable all women to see the film. Dr. H. Bloomberg, Medical Officer of Health, will prepare a tape recording of his lecture to be played back to audiences before every film show. Exfoliative cytology smears will be taken from those women who desire it, and examined under the supervision of the South African Institute for Medical Research. The examinations will be by appointment only, during the period November 1961 - February 1962. Doubtful and presumptive positive slides detected by specially trained cytotechnicians will be referred for specialist diagnosis to pathologists at the South African Institute for Medical Research.

Similar tests carried out in the United States revealed that out of every 1,000 apparently healthy women examined by this technique, at least 5 were found to have cancer *in situ*. The Brakpan experiment will serve to establish the comparable figure for South Africa. In addition, the experiment will provide valuable basic information, a blue-print as it were, to other municipalities who may subsequently wish to tackle the problem of uterine-cancer detection as a matter of routine. The lessons to be learned in Brakpan and the problems encountered should prove to be invaluable for the future.

As stated earlier, the exfoliative cytology cell examination of uterine cancer is essentially a cancer-detection test. It is utilized to trace this form of cancer in its earliest (*in situ*) stages where the disease is already present in apparently healthy women. When discovered in these very early stages the chance of cure by means of radium, X-ray and/or surgery is almost 100%. The test would obviate the problem which faces the medical profession today, namely, that uterine cancer is usually diagnosed only after patients have discovered symptoms connected with the advanced stages of the disease when it is naturally more difficult to cure. Therefore, the pilot experiment should prove invaluable, not only from the scientific and statistical point of view, but will materially increase the chances of complete cure of those women who already have the disease but do not realize it. Their early conditions will almost certainly be cured — a highly desirable state of affairs which may not otherwise be achieved if the disease were left to develop until the symptoms of the advanced form of the disease were to manifest themselves.'

THE SOUTH AFRICAN MEDICAL AND DENTAL COUNCIL : DIE SUID-AFRIKAANSE MEDIESE EN TANDHEELKUNDIGE RAAD

[INTERNS]

LIST OF APPROVED INSTITUTIONS : LYS VAN GOEDGEKEURDE INRIGTINGS

The following is a list of approved institutions recognized by the South African Medical and Dental Council, in terms of the Regulations relating to Interns (Government Notice 2006/1950), and operative as from 31 December 1961.

Hospital/Hospitaal	*No. of Posts/ Aantal Betrekkings*
Cape Province/Kaapprovinsie:	
1. Conradie Hospital, Cape Town	5
2. Frere Hospital, East London	2
3. Groote Schuur Hospital, Cape Town	40
4. Karl Bremer Hospital, Bellville	36
5. Kimberley Hospital, Kimberley	6
6. Livingstone Hospital, Port Elizabeth	4
7. No. 2 Military Hospital, Wynberg, Cape Town	3
8. Peninsula Maternity Hospital, Cape Town	3
9. Provincial Hospital, Uitenhage	2
10. Red Cross War Memorial Hospital for Children, Cape Town	7
11. Sir Henry Elliot Hospital, Umtata	2
12. Somerset Hospital, Cape Town	11
13. Victoria Hospital, Lovedale	3
14. Victoria Hospital, Wynberg, Cape Town	4
15. Woodstock Hospital, Cape Town	3

N.B. Notwithstanding the fact that a particular hospital does not appear on the list of hospitals recognized by the Council for internship purposes, the Council would be prepared to consider applications from individual interns to serve their internships in a particular hospital not appearing on the list, or from a hospital not appearing on the list for a particular intern to serve his internship in such hospital. Such applications will be treated by the Council individually on their merits.

Die volgende is 'n lys inrigtings goedgekeur deur die Suid-Afrikaanse Mediese en Tandheelkundige Raad in terme van die regulasies met betrekking tot Interns (Goewermentskennisgewing 2006/1950), en van toepassing van 31 Desember 1961 af.

Natal:	
1. Addington Hospital, Durban	20
2. Edendale Hospital, Pietermaritzburg	15
3. Grey's Hospital, Pietermaritzburg	6
4. King Edward VIII Hospital, Durban	40
Orange Free State/Oranje Vrystaat:	
1. National Hospital, Bloemfontein	10
2. Voortrekker Hospital, Kroonstad	5
Transvaal:	
1. Baragwanath Hospital, Johannesburg	33
2. Boksburg-Benoni Hospital, Boksburg	11
3. Coronation Hospital, Johannesburg	15
4. Edenvale Hospital	13
5. Far East Rand Hospital, New State Areas	6
6. Germiston Hospital	8
7. Johannesburg Hospital	29
8. Klerksdorp Hospital	4
9. Krugersdorp Hospital	7
10. No. 1 Military Hospital, Voortrekkerhoogte	4
11. Pretoria Hospital	34

N.B. Nieteenstaande die feit dat 'n besondere hospitaal nie voorkom nie op die lys van hospitale goedgekeur deur die Raad vir doeleindes van huisdokterskap, sal die Raad gereed wees om aansoeke te oorweeg van individuele interns wat as huisdokters wil dien in 'n besondere hospitaal wat nie op die lys voorkom nie, of van 'n hospitaal wat nie op die lys voorkom nie en waar 'n besondere intern as huisdokter wil dien. Sulke aansoeke sal afsonderlik en volgens verdienste deur die Raad behandel word.

ELECTION OF CANDIDATES

It is notified in terms of Regulation 3 (3) of the First Schedule to the Medical, Dental and Pharmacy Act, 1928 (Act 13 of 1928) as amended, that the following persons have been validly nominated as candidates for election as a member of the South African Medical and Dental Council for the unexpired portion of the quinquennial period ending on 31 December 1963, vice Dr. J. Black, resigned:—

Isidore Frack, Johannesburg.
Louis Franklin Freed, Johannesburg.
Jonathan Johan du Pré le Roux, Rosebank, CP.
Tobias Schneider, Johannesburg.
Edwin Wilberforce Turton, Boksburg North.

As the number of persons so nominated by medical practitioners exceeds the number of persons to be elected, Wednesday, 22 November 1961, is appointed by me as being the day on or before which every person entitled to vote at the election as a medical practitioner may sign and transmit or deliver to me a voting paper described in the Third Annexure to the First Schedule of the said Act. A voting paper will be posted to the last registered address of each person qualified to vote at the election.

W. H. Barnard
Returning Officer

6115 Oranje-Nassau Building
188 Schoeman Street
P.O. Box 205
Pretoria
6 October 1961

FORTHCOMING INTERNATIONAL MEDICAL CONFERENCES

The First European Congress of Anaesthesiology will be held by the Austrian Society of Anaesthesiology in Vienna from 3 - 8 September 1962. The former Imperial Palace will serve as the meeting place for the Congress, as well as for a post-graduate medical training course. English, French and German will be the official languages and provision will be made for simultaneous translation.

The main subjects of the Congress will be: (a) Recovery stations and special care units, (b) old patients and anaesthesia, and (c) anaesthetic problems in acute surgery. The programme will be supplemented by a series of symposia on specific problems of anaesthesia and related questions. Participants who wish to organize a symposium should contact the Scientific Secretary — who will also provide any other information regarding the scientific programme — before November 1961 at the latest. They should at the same time indicate the subject of their symposium as well as the names of the participants. For information, apply to the Secretary General, Dr. Rudolf Kucher, Medizinische Akademie, 4 Alserstrasse, Vienna IX.

IN DIE VERBYGAAN : PASSING EVENTS

Prof. J. F. Murray of the South African Institute for Medical Research, Johannesburg, attended the Executive Committee meeting of the Council for International Organizations of Medical Sciences held in Paris on 5 - 7 October. Before returning to South Africa he will visit research centres in London, Brussels and Copenhagen.

* * *

Dr. Henri J. du Toit, gewese Hoof van die Chirurgiese Eenheid, Baragwanath-hospitaal, en die Universiteit van die Witwatersrand, praktiseer vanaf 1 Oktober as spesialis-chirurg te Jenner-gebou 10, Jeppestraat, Johannesburg. Telefone: Spreekkamers 23-5854 en 23-6684, noodoproepe 22-4191. Hierdie nommers verskyn nog nie in die telefoongids nie. Dr. du Toit is tans dosent aan die Kollege van Chirurge van Suid-Afrika.

Mr. Henri J. du Toit, formerly Head of the Surgical Unit, Baragwanath Hospital, and the University of the Witwatersrand, commenced practice on 1 October as a specialist surgeon at 10 Jenner Buildings, Jeppe Street, Johannesburg. Telephones: Rooms 23-5854 and 23-6684, emergencies 22-4191. These telephone numbers do not appear in the telephone directory. Mr. du Toit is a lecturer at the South African College of Surgeons.

* * *

Edenvale Hospital, Johannesburg, Clinical Meeting. The next clinical meeting will be held on Wednesday 25 October at 8.00 p.m. in the Board Room. The meeting will take the form of a symposium on hypertension. Dr. B. A. Bradlow will discuss 'Clinical aspects and treatment', Dr. M. H. Fainsinger will speak on 'Radiological studies', and Dr. G. I. Frank will speak on 'Pathological aspects'. A discussion will follow, opened by Dr. Gus Lange. All those interested are invited to attend this meeting.

* * *

University of Cape Town and Association of Surgeons of South Africa (M.A.S.A.), Joint Lectures. The next lecture in this series will be held on Wednesday 18 October at 5.30 p.m. in the E-floor Lecture Theatre, Groote Schuur Hospital, Observatory, Cape. Dr. P. Baker will speak on 'Coronary artery disease and the surgical approach to the problem'.

* * *

The South African Institute for Medical Research, Johannesburg, Staff Scientific Meeting. The next meeting will be held on Monday 23 October 1961 at 5.10 p.m. in the Institute Lecture Theatre. Prof. B. J. P. Becker will speak on 'Some aspects of the pathology of idiopathic heart disease'.

* * *

Somerset Hospital, Monthly Clinical Evening, will be held on Tuesday 17 October at 8.15 p.m. in the Nurses' Main Lecture Hall, Somerset Hospital, Green Point. All those interested are invited to attend this meeting.

Drs. Christian Bam en Rhoderic W. A. Nel, ginekoloë en verloskundiges van Kaapstad, het vanaf 1 Oktober 1961 in vennootskap begin praktiseer in die Groote Kerk-gebou, Kaapstad, sowel as Bellville Mediese Sentrum, Bellville.

Drs. Christian Bam and Rhoderic W. A. Nel, gynaecologists and obstetricians of Cape Town, are practising in partnership as from 1 October 1961, at Groote Kerk Buildings, Cape Town, as well as Bellville Medical Centre, Bellville.

* * *

The South African Society of Occupational Health (M.A.S.A.). The following resolutions were passed at a meeting of the Society held on 27 September 1961:

(1) That the Government be requested to recognize chronic alcoholism as an illness in terms of the Unemployment Insurance Act 1946, and that unemployment sick-pay facilities be extended to persons falling under this Act, provided they permit themselves to be treated and rehabilitated by the members of the medical profession.

(2) That this meeting of the South African Society of Occupational Health considers it essential that the Government should appoint a medical inspectorate of factories and machinery for the Republic of South Africa.

* * *

Lede word daaraan herinner dat hulle die Sekretaris van die Mediese Vereniging van Suid-Afrika, Posbus 643, Kaapstad, sowel as die Registrateur van die Suid-Afrikaanse Geneeskundige en Tandheelkundige Raad, Posbus 205, Pretoria, moet verwittig van enige adresverandering. Versuim hiervan beteken dat die *Tydskrif* nie afgelewer kan word nie. Dit het betrekking op lede wat oorsee gaan sowel as dié wat binne die Republiek van adres verander.

* * *

Dr. L. Resnick, obstetrician and gynaecologist, of Cape Town, has changed his address as from 2 October to 904 Medical Centre, Cape Town. The telephone number remains 2-2617.

* * *

Dr. H. Grusin, specialist physician, of Johannesburg, has gone overseas on a short tour. He will attend the 5th meeting of the British Atherosclerosis Study Group on 'Epidemiology of coronary heart disease', to be held at Lincoln College, Oxford. Dr. Grusin will read a paper on certain research investigations undertaken on South African Whites, Bantu and Indians bearing on coronary artery disease. The contribution describes research work being undertaken by Dr. A. R. P. Walker's research group at the South African Institute for Medical Research, Johannesburg, with which Dr. Grusin, and also Dr. H. C. Seftel of Baragwanath Hospital, are closely associated. Work is supported in part by a grant from the National Heart Institute, USA Public Health Service.

BOEKBESPREKINGS : BOOK REVIEWS

BIOCHEMISTRY

Biochemists' Handbook. Ed. by Cyril Long, M.A., B.Sc., D. Phil., F.R.S.E. Pp. xxii+1192. Illustrated. R16.80. London: E. & F. N. Soon. 1961.

This handbook presents in a concise form a wealth of biochemical information of qualitative and quantitative nature. Altogether 172 authorities from 18 different countries were invited to contribute. The index contains about 8,800 entries.

The data are presented in 5 major divisions, as follows:

1. Important topics in physical and organic chemistry, which are most useful to biochemists, including methods in the use of isotopes, flame photometry, spectroscopy, fluorimetry, electrophoresis, and chromatography.

2. Enzyme kinetics and descriptions of about 300 individual enzymes.

3. Metabolic pathways.

4. Data on the chemical composition of animal and plant tissues.

5. A physiological section including nutritional data. This section includes *inter alia* information about the preparation of laboratory stock solutions, biochemical analyses, accepted concepts with respect to the physiology of blood clotting, blood groups, and the chemistry of hormones and of foods.

This concise handbook with its enormous amount of information and comprehensive bibliography should prove invaluable to research workers and teachers of biochemistry and biology. A.v.Z.

RUMATIEKKOORS

Nature of Rheumatic Heart Disease. By George E. Murphy, M.D. Pp. 95. 162 colour figures. R2.80. Postage: 17½c. London: Ballière, Tindall and Cox Ltd. 1960.

Die doel van dié kommunikasie, soos deur die outeur gestel, is om te probeer bewys dat die Aschoff-liggaampie en ander letsels in rumatiese hartsiekte ontstaan van spierselle en soms ook van gladde spierselle. Hierin slaag hy wel deeglik.

Die werk berus op die histologie van postmortem- en operasiegevalle en word gestaaf deur eksperimente waarby streptokokkale infeksie aangebring word by hase. Die uitstekende monograaf word afgesluit met 162 kleurfoto's van histologiese snitte en dit is van 'n besondere hoë gehalte. J.S.

BRIEWERUBRIEK : CORRESPONDENCE

THE RESULTS OF TREATMENT IN CERTAIN TYPES OF INCONTINENCE

To the Editor: I read with great interest Mr. J. A. Currie's excellent report[1] in your *Journal* of 19 August 1961 on the cure of stress incontinence by the Millin I operation. Gynaecologists had apparently failed to cure 9 of these after one or more colporrhaphies. This failure to cure is frequently caused by ignorance of the proper technique and lack of attention to detail in performing the anterior colporrhaphy. The resulting disappointments have boosted exotic procedures like the Millin I, the Aldridge and Marshall-Marchetti-Kranz operations, which have come into undue prominence for the cure of stress incontinence. Over many years I have not seen one case that necessitated any of these operations, although a young colleague was able to muster 14 Aldridge operations in a few years. The fact that Kennedy (1960) reported 2 deaths in 34 cases with the Millin I technique, and Professor Jeffcoate (1956) 1 death with 44 Aldridge operations, should be deterrent enough for anybody, and a healthy stimulus to simpler and less dangerous techniques.

The success of operative treatment for stress incontinence by the vaginal route depends on the state of the pubocervical fascia and the way it is treated. So far I have only seen one case where the fascia was so deficient that the cure of cystocele was well-nigh impossible, but where the para-urethral layers were sufficient to cure the stress incontinence. Everything that is claimed for the Marshall-Marchetti-Kranz operation can be more efficiently done *per vaginam*.

In a series of 1,855 cases of colporrhaphies with or without vaginal hysterectomy, 656 patients had definite stress incontinence, of whom 211 had it so severely that their complaint was 'Dit loop sommer uit'. Of all the above patients 6 returned uncured. Three were subsequently cured by operation, the other 3 failed to come back.

Intensive studies, including X-rays, have not increased our knowledge of the causal factors of this puzzling complaint, but have certainly led to more complicated operations. Paul Hodgkinson (Detroit, 1957), a research stalwart, put it tersely: 'As long as the cause of urinary stress incontinence remains obscure, treatment will be empiric and results remain uncertain'. I heartily agree with him, for it is my firm belief that the judicious use of sufficient pubocervical fascia gives a 99% cure rate. Only atrophic or insufficient fascia, which I have not yet come across, will need the greater operations. The ordinary anterior colporrhaphy is not enough.

Perhaps I may be forgiven if I quote the following verse concerning the enterprising young surgeon who prefers complicated procedures:

> 'But surely he should be content
> To cure all the incontinent
> By simpler means, and not invent
> More dangerous ops,
> And look so pleased and complacent
> When leaking stops.'

The gynaecologist who perfects the simpler methods will get all the results he wishes with normal healing, and will also avoid tragedies and complications. The object of this letter is not to criticize Mr. Currie or his results, however dangerously achieved, but rather to stimulate gynaecologists to improved methods and fewer failures. I heartily congratulate him on his success where others have failed.

C. F. Krige

103 Lister Building
Jeppe Street
Johannesburg
20 September 1961

1. Currie, J. A. (1961): S. Afr. Med. J., 35, 677.

THE RESULTS OF TREATMENT IN CERTAIN TYPES OF INCONTINENCE

To the Editor: Through the courtesy of Dr. Krige I have been able to see his letter before publication, and I should like to reply to one or two of his remarks.

I am in agreement with a great deal of what he says, and, indeed, the smallness of my series is largely caused by the fact that I refer my cases to gynaecologists in the belief that colporrhaphy is generally the best cure for stress incontinence in females, particularly in those with some degree of prolapse.

The slight sting in the tail of Dr. Krige's letter, when he refers to my results, 'however dangerously achieved,' needs some reply. I believe that the Millin I operation, once properly learnt, is comparatively easy for those accustomed to working in the retropubic space, and not particularly dangerous. The complications I encountered were met while I was still learning how to do the operation properly. Dr. Krige's description of the operation as an 'exotic procedure' is perhaps justified, but my contention is that it works.

J. A. Currie

Dumbarton House
Church Street
Cape Town
2 October 1961

THE STATUS OF THE GENERAL PRACTITIONER

To the Editor: Regarding the Editorial in the *Cape Argus* of 26 September on the subject of Prof. J. F. Brock's remarks at the Medical Congress on the declining status of the general practitioner,* I wish to say that I agree with the Editor of the Cape Argus when he says that not everyone is distressed at this declining status and that the public do not feel that way. Here in the Western Cape, and particularly in Cape Town, the general practitioners are perfectly satisfied with their status and particularly with their relations with the public. I feel that Professor Brock in trying to side with and help the general practitioners is doing them a disservice by harping on the subject of status. By and large, there has been no decline in our practices, and our relationships with our patients remain at top level. I feel our patients like us, confide in us, and treat us with respect and affection. Possibly, as the Argus Editor intimated, certain consultants and specialists feel that our status is declining; but that is nothing to what we general practitioners feel about the status of a large number of specialists.

Professor Brock also stated that general practitioners need more training, reading, and keeping up-to-date. I agree, but also feel that not only the general practitioners need this, but all medical men. We general practitioners are not making more mistakes or maiming and killing more patients than ever before. There are even occasions when we show a semblance of skill, courage, nerve, compassion, kindness and the will never to give up hope. Some even have the ability to treat the patient as a whole and not just an orifice or one limb.

The whole trouble of course is the separate registers. Do away with that and the feeling between all will be one of harmony and friendship.

L. Babrow

St. George's Street
Cape Town
28 September 1961

[* In referring to the status of the general practitioner, Professor Brock said: 'Everyone is distressed at what appears to be a declining status of the general practitioner. If there is such a decline it is only in his reputation in the public mind vis-à-vis the specialist. I am convinced that there is no decline in his medical knowledge and judgment nor in the wisdom of his approach to the sick patient in his own home'—Editor.]